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EXAMINER	
MOORE, KARLA A	

ART UNIT	PAPER NUMBER
1763	

DATE MAILED: 05/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/728,126	GRANNEMAN, ERNST H. A.	
	Examiner	Art Unit	
	Karla Moore	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 March 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22 and 55-65* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22 and 55-65* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *3 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 9-19 and 22 are rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 6,183,565 to Granneman et al. in view of U.S. Patent No. 4,859,625 to Matsumoto.

3. Granneman et al. disclose a film deposition station for depositing a film onto a substrate substantially as claimed and comprising: a first part and a second part for accommodating a semiconductor substrate between them, the first part and the second part positioned opposite each other and parallel to the substrate upon retention of the substrate between the first and second parts, wherein the first and the second part are configured to be spaced less than about 2 mm from a major surface of a substrate accommodated between them, wherein at least one of the parts is provided with a heater for heating that part, and wherein each part is provided with a set of gas supply channels connected to a gas source.

4. However, Granneman et al. fails to teach the source of the gas for the first part is configured to supply mutually reactive reactants in a sequence of alternating, separated pulses for atomic layer deposition (ALD).

5. Matsumoto teaches configuring a deposition apparatus to supply mutually exclusive reactive reactants in a sequence of alternating, separate pulses for the purpose of forming a film of mixed materials wherein the thickness of the film can be controlled in monolayer accuracy (column 2, rows 44-49).

6. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a deposition apparatus configured to supply mutually exclusive reactants in a

sequence of alternating, separate pulses in Granneman et al. in order to form a film of mixed materials wherein the thickness of the film can be controlled in monolayer accuracy.

7. With respect to claim 9, in Granneman et al., the gas supply channels are configured to discharge gas to fully support the substrate between the first part and the second part. See Figure 2.

8. With respect to claims 10 and 11, one of the parts is configured to be at a higher temperature than the other of the parts, wherein the film deposition station is configured to supply the reactants in alternating, separate pulsed front the one of the parts that is at a higher temperature. In Granneman et al. each part comprises an individual heating element (8 and 9) and is connected to a controller (5), thus they are capable of being heated to different temperatures. Either one of the parts having the higher temperature. See column 4, rows 56-57 and column 5, rows 37-39.

9. With respect to claims 12 and 13, the first part and the second part are configured to be spaced less than about 0.5 mm from a major surface of a substrate (column 6, rows 54-56).

10. With respect to claim 14, the gas supply channels are configured to cause rotation of the substrate (column 6, rows 61-64).

11. With respect to claim 15, Granneman et al. disclose a reactor for semiconductor processing substantially as claimed and comprising: an upper reactor block and a lower reactor block for accommodating a semiconductor substrate between them, wherein the upper and the lower reactor blocks are configured to be less than about 2 mm from a major surface of the substrate when the substrate is retained therebetween. See above for description.

12. With respect to claim 16, the upper and the lower reactor blocks are configured to be heated to temperatures at which condensation or decomposition of the mutually reactive reactants is substantially prevented. The temperature to which the reactor blocks are heated is a processing parameter, not a structural limitation that would depend on the materials used and substrate processed. The courts have ruled that a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the

prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987)

13. With respect to claim 17, the upper and lower reactor blocks are configured to be heated to different temperatures. As noted above each of the upper and lower reactor blocks is capable of being heated to a separate temperature.

14. With respect to claim 18, the upper and lower block are configured to heat the substrate to a different temperature during each pulse. Matsumoto teaches heating the substrate to a different temperature for different materials (column 11, row 66 through column 12, row 40).

15. With respect to claim 19, the lower block is vertically movable relative to the upper block to allow for decreasing and increasing the distance between the substrate and the reactor blocks for loading and unloading of the substrates. See column 5, rows 26-29 of Granneman et al.

16. With respect to claim 22, the upper and lower blocks are configured to be less than about 1 mm from a major surface of the substrate (column 6, rows 54-56).

17. Claims 2 and 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Granneman et al. and Matsumoto as applied to claims 1, 9-19 and 22 above, and further in view of U.S. Patent No. 6,478,872 to Chae et al.

18. Granneman et al. and Matsumoto disclose the invention substantially as claimed and as described above.

19. However, Granneman et al. and Matsumoto fail to teach each set of gas supply channels comprises a plurality of horizontal gas dispersion channels connected to a plurality of vertical injection channels, the plurality of horizontal gas dispersion channels providing gas to the plurality of vertical injection channels, wherein the plurality of vertical gas injection channels are configured to discharge gas onto a major surface of the substrate.

20. Chae et al. disclose a gas supply structure comprising a plurality of horizontal gas dispersion channels connected to a plurality of vertical injection channels, the plurality of horizontal gas dispersion channels providing gas to the plurality of vertical injection channels, wherein the plurality of vertical gas

injection channels are configured to discharge gas onto a major surface of the substrate for the purpose of delivering two or more mutually reactive gases to a substrate wherein formation of contaminating particles is prevented (Figure 6 and abstract).

21. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a plurality of horizontal gas dispersion channels connected to a plurality of vertical injection channels, the plurality of horizontal gas dispersion channels providing gas to the plurality of vertical injection channels in Granneman et al. and Matsumoto in order to deliver two or more mutually reactive gases to a substrate wherein formation of contaminating particles is prevented as taught by Chae et al.

22. With respect to claim 6, the vertical gas injection channels are positioned to extend uniformily across an entire major surface of the substrate. See Figures 6 and 7 of Chae et al.

23. With respect to claim 7, wherein the horizontal gas dispersion channels extend radially across an interior of the first and second parts. See Figures 6 and 7 of Chae et al.

24. With respect to claim 8, the mutually reactive reactants are supplied through the first part, wherein the first part comprises a set of separate gas supply channels for each reactant, wherein the sets of separated gas supply channels are vertically and horizontally replaced relative to one another. See Figures 6 and 7 of Chae et al.

25. Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Granneman et al. Matsumoto and Chae et al. as applied to claims 2 and 6-8 above, and further in view of U.S. Patent No. 6,086,677 to Umotoy et al.

26. Granneman et al. Matsumoto and Chae et al. disclose the invention substantially as claimed and as described above.

27. However, Granneman et al. Matsumoto and Chae et al. fail to explicitly teach the dimensions of the gas channels.

28. Umotoy et al. teach that the choice of hole size for each gas is purely a process condition and as such, hole, size will depend on gas flow rate, gas pressure, gas type, chamber pressure and the like (column 5, rows 57-63).

29. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to find an optimum gas hole configuration in Granneman et al., Matsumoto and Chae et al. based on conditions of the individual process as taught by Umotoy et al.

30. Further, the courts have ruled where the general conditions of a claim are disclosed by the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 2235 (CCPA 1955).

31. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Granneman et al. and Matsumoto as applied to claims 1, 9-19 and 22 above, and further in view of U.S. Patent Publication No. 2002/0046490 to Chiang et al.

32. Granneman et al. and Matsumoto disclose the invention substantially as claimed and as described above.

33. However, Granneman et al. and Matsumoto fail to teach the apparatus further comprising a removable shield attached to the lower block, wherein the reactor is configured to concentrate deposition of the at least two mutually reactive reactants on the removable shield relative to other surfaces of the reactor.

34. Chiang et al. teaches the use of a removable shield in a deposition apparatus for the purpose of controlling a variable gas conductance of the chamber (abstract and paragraph 151).

35. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a removable shield in Granneman and Matsumoto in order to control a variable gas conductance of the chamber as taught by Chiang et al.

36. With respect to claim 21, the removable shield is configured to be heated to the same temperature as the lower block, that is it can be temperature regulated (see abstract and paragraph 151)..

37. Claims 55-65 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,183,565 to Granneman et al. in view of U.S. Patent No. 4,859,625 to Matsumoto and U.S. Patent No. 6,478,872 to Chae et al.

38. Granneman et al. disclose a film deposition station for depositing a film onto a substrate substantially as claimed and comprising: a first part and a second part for accommodating a semiconductor substrate between them, the first part and the second part positioned opposite each other and parallel to the substrate upon retention of the substrate between the first and second parts, wherein the first and the second part are configured to be spaced less than about 2 mm from a major surface of a substrate accommodated between them, wherein at least one of the parts is provided with a heater for heating that part, and wherein each part is provided with a set of gas supply channels connected to a gas source.

39. However, Granneman et al. fails to teach the source of the gas for the first part is configured to supply mutually reactive reactants in a sequence of alternating, separated pulses for atomic layer deposition (ALD).

40. Matsumoto teaches configuring a deposition apparatus to supply mutually exclusive reactive reactants in a sequence of alternating, separate pulses for the purpose of forming a film of mixed materials wherein the thickness of the film can be controlled in monolayer accuracy (column 2, rows 44-49).

41. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a deposition apparatus configured to supply mutually exclusive reactants in a sequence of alternating, separate pulses in Granneman et al. in order to form a film of mixed materials wherein the thickness of the film can be controlled in monolayer accuracy.

42. Granneman et al. and Matsumoto disclose the invention substantially as claimed and as described above.

43. However, Granneman et al. and Matsumoto fail to teach each set of gas supply channels comprises a plurality of horizontal gas dispersion channels connected to a plurality of vertical injection

channels, the plurality of horizontal gas dispersion channels providing gas to the plurality of vertical injection channels, wherein the plurality of vertical gas injection channels are configured to discharge gas onto a major surface of the substrate.

44. Chae et al. disclose a gas supply structure comprising a plurality of horizontal gas dispersion channels connected to a plurality of vertical injection channels, the plurality of horizontal gas dispersion channels providing gas to the plurality of vertical injection channels, wherein the plurality of vertical gas injection channels are configured to discharge gas onto a major surface of the substrate for the purpose of delivering two or more mutually reactive gases to a substrate wherein formation of contaminating particles is prevented (Figure 6 and abstract).

45. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a plurality of horizontal gas dispersion channels connected to a plurality of vertical injection channels, the plurality of horizontal gas dispersion channels providing gas to the plurality of vertical injection channels in Granneman et al. and Matsumoto in order to deliver two or more mutually reactive gases to a substrate wherein formation of contaminating particles is prevented as taught by Chae et al.

46. With respect to claim 56, at least one of the parts is provided with a heater (8 and 9).

47. With respect to claim 57-59, in Chae et al., each set of gas supply channels comprises a plurality of horizontal gas dispersion channels connected to a plurality of vertical gas injection channels, the plurality of horizontal gas dispersion channels providing gas to the plurality of vertical injection channels, wherein the plurality of vertical gas injection channels are configured to discharge gas onto a major surface of the substrate; the horizontal gas dispersion channels for one set of the gas supply channels are horizontally spaced relative to the horizontal gas dispersion channels for the other set; and further, the horizontal gas dispersion channels for one set of gas supply channels are vertically displaced relative to the horizontal gas dispersion channels for the other set.

48. With respect to claim 60, in Granneman et al., the second part is provided with a set of gas supply channels to discharge gas onto a second major surface of the substrate, opposite to the major surface.

49. With respect to claim 61, the first and second parts are configured to be spaced less than about 2mm from a major surface of the substrate accommodated between them (column 6, rows 54-56).

50. With respect to claim 62, the first and second parts are configured to repeatedly cycle between a relatively high temperature during pulses of one of the first and second reactants and a relatively low temperature during pulses of the other of the first and second reactions. Matsumoto teaches this limitation for the purpose of providing each of the materials with the appropriate processing conditions.

51. With respect to claim 63, the deposition station is configured to alter a distance between the substrate and the first and second parts while cycling between the relatively high temperature and the relatively low temperature (see Granneman et al. column 4, rows 7-10).

52. With respect to claim 64, the deposition station is configured to alter a thermal conductivity of gas between the substrate and the first and second parts while cycling between the relatively high temperature and the relatively low temperature. Granneman et al. teach that the when the gas is changed the thermal conductivity changes, as well (column 3, rows 27-29). That is the thermal conductivity of gas is related to the type of gas which is also related to the temperature of the first and second parts.

53. With respect to claim 65, the deposition station is configured to maintain the first and the second parts at temperatures at which condensation or decomposition of the reactants is substantially prevented, while heating the substrate to one or more temperatures at which decomposition of condensation of the mutually reactive reactants occurs (abstract).

Response to Arguments

54. Applicant's arguments filed 15 March 2006 have been fully considered but they are not persuasive.

54. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of

ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, as noted in the previous office action, motivation for providing a deposition apparatus configured to supply mutually exclusive reactants in a sequence of alternating, separate in order to form a film of mixed materials wherein the thickness of the film can be controlled in monolayer accuracy. This is the motivation for modifying the configuration of Granneman et al.

55. Further, Contrary to Applicant's remarks, the requirement for combination of two (or more) references is not that they be combinable exclusively with each other and no other references. Nor does each of the references have to provide motivation for the combination. If one suggest the desirability for the combination, that is sufficient. Both Matsumoto and Chae provide motivation for combination in the above rejections. Examiner maintains that the motivations described above are sufficient. Although, Examiner notes that a further reason for combining Granneman et al. with Matsumoto would be to achieve rapid heat transfer between a substrate and a deposition station.

56. Examiner disagrees with Applicant's conclusion that Granneman et al. teaches away from the presently claimed apparatus. Both Granneman et al. and the claimed apparatus teach that processing conditions will necessarily vary when different gases are supplied to a deposition station. There is no reason to assume that all conditions must remain static and that if they don't undesirable changes will occur. Rather, they both teach that changes will occur and processing parameters can be optimized to obtain the desired conditions, method and results.

Conclusion

57. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH

shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karla Moore whose telephone number is 571.272.1440. The examiner can normally be reached on Monday-Friday, 8:30am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571.272.1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Karla Moore
Primary Examiner
Art Unit 1763
25 May 2006